primary immune deficiency disorders—explained by doctor malik:
SCID—severe combined immune deficiency, it's the most serious of primary immune deficiencies
and it's group of related diseases that all affect T & B cells function hence combined but with different causes.
the X-linked SCID is the most common form of the disease.
the abnormal gene involved codes for a protein chain called the common gamma chain which is common to receptors
for interleukins 2, 4, 7, 9, 15, and 21 and it's located on the X chromosome.

normal signaling cannot occur in cells with defective receptors preventing natural
maturation although this chain was first identified as part of the interleukin-2 receptor incurred interleukin-7 signaling is the likely source for both T and B cells developmental defects while lack of interleukin-15 is believed to account for the block of NK cells.

jak3 deficiency may be found without the common gamma-chain deletion, this results in an autosomal recessive form of SCID affecting both males and females.
defects in the pathways involved in the recombination events that produce immunoglobulin and t-cell receptors highlight the importance
of early signaling through these receptors for lymphocyte survival.

mutations in recombinase activating genes RAG1 & RAG2 and genes encoding proteins involved in DNA excision repair pathways employed during gene
rearrangement like artemis can also lead to SCID.
another relatively common defect resulting in SCID is adenosine deaminase deficiency adenosine, deaminase catalyzes
conversion of adenosine or deoxy-adenosine to inosine or deoxy inosine respectively, its deficiency results in the intracellular accumulation of toxic
adenosine metabolites which interferes with purine metabolism and DNA synthesis.

this housekeeping enzyme is found in all cells so these toxic compounds also produce neurologic and metabolic symptoms including deafness, behavioral problems, and liver damage.
another t-cell defect is the hyper IgM syndrome when an inherited deficiency CD40 ligand which is also called CD154 that will lead to
impaired communication between T cells and antigen presenting cells highlighting the role of this surface molecule in this co-stimulatory process.

in this x-linked disorder the helper T-cells fail to express function CD40 ligand on plasma membranes which typically interact with CD40 molecules present on B cells and dendritic cells, the B cell responds to T-independent antigens and is unaffected
accounting for the presence of IgM antibodies in these patients which range from normal to high levels and give the disorder its common name hyper-IgM syndrome

now we'll move into the defects of neutrophil function and the classical example is the chronic granulomatous disease (CGD)

is caused by an inhireted defect in then NADPH oxidase enzyme complex present in variety of cells including phagocytes, NADPH oxidase
complex consists of two membrane spanning subunits: the GP91 phagocyte oxidase (phox-91) and the P22 phox as well as 3 cytosol in components B47, B67 and B40
approximately 66% of all CGD cases result from mutations within the x-linked GP91 phox gene followed by the autosomal recessive forms when
defects in the genes coding for b-47 accounting for 30% of all CGD cases

NADPH oxidase is required for the respiratory burst and has a critical role in microbial killing, it reduces molecular oxygen to superoxide which
subsequently forms reactive oxygen species such as hydrogen peroxide, hypochlorous acid and hydroxyl radicals.

patients are particularly susceptible to fungal infections typically from aspergillus species but also catalase positive bacteria including
Staphylococcus aureus, Serratia marcescens, and Burkholderia cepacia.
most patients present with infections typically lymph node abscesses but also return to respiratory infections deep-seated abscesses and septicemia.

making the diagnosis of CGD is not technically difficult and historically is based on the use of the gold standard nitroblue tetrazolium assay.

recent assay is flow cytometry based on the reduction of dihydrorhodamine by stimulated phagocytic cells and is particularly useful as it can
demonstrate to populations of cells incarriers.
for complement deficiencies deficiencies in the early complement component C1q, C4 and C2 are usually associated with lupus like syndrome.
C3 deficiency may also have a lupus like a clinical presentation but it's more likely to involve recurrent encapsulated organism infection

deficiencies of the later components of the complement C5-C9 are often associated with recurrent Neisseria infections.
deficiency of C1-eserase inhibitor has been found in patients with hereditary angioedema.
most complement deficiencies appear to be inherited in an autosomal recessive manner.